



Telling Time, Back in Time: How Nautical Instruments and Astronomy Were Used to Determine Time of Day



Chronometer, © Mystic Seaport, 1941.255

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Subject: Science, Astronomy

Grade Levels: 6-8

Timeframe: 2 – 45 minute sessions

Introduction: Within an astronomy unit, students will develop their sense of spatial reasoning as well as their understanding of how patterns of the sun, Earth, and moon are related to time of day, seasons, eclipses, tides, etc. After building some background knowledge about Earth's rotation and day and night, students will apply their learning to evaluate the structure and function of authentic technology that was used by sailors in a time before modern technology.

Grade Level Content Standards

ESS1.B: Earth and the Solar System

- The solar system consists of the sun and a collection of objects, including planets, their moons, and asteroids that are held in orbit around the sun by its gravitational pull on them. (MS-ESS1-2),(MSESS1-3)
- This model of the solar system can explain eclipses of the sun and the moon. Earth's spin axis is fixed in direction over the short-term but tilted relative to its orbit around the sun. The seasons are a result of that tilt and are caused by the differential intensity of sunlight on different areas of Earth across the year. (MS-ESS1-1)

Compelling Question:

- In what ways did advances in technology, utilized by sailors, help them determine the time of day?

Supporting Questions

- How are structure and function related in the following nautical technology: sundial, chronometer, sextant, compass?
- How does the relative position of sun change depend on time of day, location on earth, and season?

Objectives: Students will...

- Evaluate the structure and function of nautical tools in determining the time of day.
- Create an explanation for how to tell time of day based on evidence compiled from a nautical instrument.

Materials/Resources needed for students:

Source #1: Chronometer http://educators.mysticseaport.org/artifacts/instrument_chronometer/

Source #2: Sextant http://educators.mysticseaport.org/artifacts/instrument_sextant/

Source #3: Sundial

<http://mobius.mysticseaport.org/detail.php?term=sundial&module=objects&type=keyword&x=0&y=0&kv=182364&record=9&module=objects>

Source #4: Compass http://educators.mysticseaport.org/artifacts/whyte_telltale_compass/

Inquiry Activity (the basis of the lesson that drives students toward the compelling question):

Problem: It's a beautiful sunny day in Mystic, CT. You are out for a leisurely sail aboard the [Breck Marshall](#) before your dinner reservation at 5pm. About mid-day you realize you have forgotten your cell phone, and watch! You know it will take you 2 hours to get back to shore. How will you know when it is time to head back in?

Jigsaw: Students are broken into 4 groups. Each group will be assigned one of the nautical navigation artifacts: sundial, chronometer, sextant, compass. Students will investigate the artifact on <http://educators.mysticseaport.org> and complete an object analysis worksheet to evaluate the structure and function of their assigned nautical instrument. Then, students will develop a presentation to answer the "problem". Students' presentations will be scored based on the presentation rubric. They must include:

- A thorough description of the structure of the object. (including images)
- A predicted function for the object justified by evidence. (i.e. What is this object used for? Why do you think that based on its structure? Why do you think that based on your prior knowledge of astronomy?)
- A thorough explanation to answer to the "problem" rooted in prior knowledge of astronomy.

Communicating Conclusions/Taking Informed Action (How students will demonstrate their learning)**Communication/Action #1:**

Students will write descriptive observations of the structure of the object based on guiding questions. Then, using evidence and prior knowledge, students will explain the function of the object and support their claims with evidence.

ASSESSMENT: [Object Analysis Worksheet \(on educators.mysticseaport.org\)](#)

Communication/Action #2:

Students will construct presentations addressing the problem of telling time utilizing their assigned artifact.

ASSESSMENT: Presentation Rubric

Source Materials

All items found on: [Mystic Seaport for Educators](#)

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Source #2: Sextant http://educators.mysticseaport.org/artifacts/instrument_sextant/

Source #3: Sundial

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